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| 10/087,191 | 02/28/2002 | Richard E. Jaeger | QUANT1390 (028248-3201) | 8645 |
| 30542 | 7590 | 10/14/2003 | EXAMINER | |
| FOLEY & LARDNER P.O. BOX 80278 SAN DIEGO, CA 92138-0278 | | | SASTRI, SATYA B | |
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1713

DATE MAILED: 10/14/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/087,191

Applicant(s)

JAEGER, RICHARD E.

Examiner

Satya B Sastri

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-39 and 41, 42 is/are rejected.
- 7) ☒ Claim(s) 40 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

1. This office action is in response to application filed on February 28, 2002. *Claims 1-42* are now pending. Election requirement requested by the examiner is withdrawn and all claims are examined in this office action.

Claim Rejections - 35 USC § 101

2. *Claims 38 and 39* are rejected under 35 U.S.C. 101 because:
the claimed invention is directed to "A bond line"- a non-statutory subject matter.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. *Claims 1-23, 26-39, 4, 42* are rejected under 35 U.S.C. 103(a) as being unpatentable over Dershem et al. (US 5,232,962) in view of Dershem et al. (US 6,034,194).

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The prior art to Dershem et al. ('962) is in regard to **adhesive composition** with bond line limiting spacer having a hardenable adhesive component and a plurality of spacers, the **bond line thickness** being maintained at a selected limit by the **spacer elements** (abstract). The disclosure further includes that the **adhesive vehicle** and **spacer elements** may be formed from many different materials depending on the nature of the materials to be bonded and the bonding composition itself. An example of the adhesive vehicle includes an epoxy resin (column 2, lines 64-69 and column 3, lines 1-16). The **spacer element** may be collapsible and based on **organic polymers** such as collapsible **spheroids** made from polypropylene carbonate and **polyalkyl methacrylate resins**. The plastics determined to be useful as collapsible spacer elements may be non-charring, depolymerizable polymers having relatively low softening point, between 35-105°C (column 3, lines 56-69 and column 4, lines 1-18). Working example 1 (columns 4-5) includes polyisobutyl methacrylate particles which are **spherical in shape** and classified to a mesh size of **-100 to +200 mesh**. A **semiconductor die-attach bonding composition** comprising adhesive paste composition may be used in **bonding a pair of surfaces in a semiconductor device** (column 15, lines 4-23). The bond line thickness in the working examples of the prior art is within the claimed range.

The difference between the prior art and the present invention is the inclusion of a maleimide-containing monomer in the adhesive composition in the present invention. The prior art discloses as an example, an epoxy resin but includes that other resins may be chosen depending on the end use.

The prior art to Dershem et al. ('194) discloses adhesives comprising **bismaleimides**, **0.1 to 10 wt.% coupling agent**, **0.2 to 3 wt.% radical initiator** (column 1, lines 55-67). Initiators

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may be free radical initiators which decompose at temperatures in the range of about 70-180°C (column 5, lines 45-65). 10-80% of the adhesive composition may further be combined with **20 to 90 wt.% filler** which may be **electrically and/or thermally conductive**, and/or fillers to modify the rheology of the compositions (column 6, lines 5-24). The **linking unit in the bismaleimide monomer** may be based on **alkylene, aromatic bridging units, polyalkylene oxide, siloxanes** etc. (column 2, lines 1-68 and column 3, lines 1-6). The disclosure further includes that the disclosed adhesive compositions based on bismaleimide resins exhibit suitable viscosity for convenient handling and cure rapidly. Furthermore, the resulting thermosets are stable to elevated temperatures, are highly flexible, have low moisture uptake and good adhesion to both the substrate and device attached thereto (abstract). In light of such benefits, it would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate bismaleimide resins in the adhesive compositions comprising spacers as disclosed by Dershem et al. ('962) and thereby obtain the present invention (*claims 1, 5-9, 12-15, 19-23, 26, 28-39, 41, 42*).

Working example 1 (columns 4-5) includes polyisobutyl methacrylate particles which are **spherical in shape** and classified to a mesh size of **-100 to +200 mesh**. A reasonable basis exists to believe that the claimed particle sizes in *claims 2-4* would inherently be within the mesh sizes disclosed in the prior art.

In regard to *claims 10, 11, 16-18, 27*, wherein the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine optimization. In re Boesch and Slaney 205 USPQ 215 (CCPA 1980).

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5. *Claims 24, 25* are rejected under 35 U.S.C. 103(a) as being unpatentable over Dershem et al. (US 5,232,962) in view of Dershem et al. (US 6,034,194) and Dershem et al. (US 5,717,034).

The disclosures of Dershem et al. are elaborated in paragraph 4 above and are incorporated herein by reference.

The difference between the prior art and the present invention is the use of organic polymer based filler in the adhesive compositions.

The prior art to Dershem et al. ('034) discloses adhesive formulations comprising perfluorinated hydrocarbon polymers as fillers. The disclosure includes that such compositions display excellent rheological properties, in addition to excellent dielectric properties, i.e. very low conductivity (abstract). In light of such benefits, it would have been obvious for one of ordinary skill in the art at the time the invention was made to incorporate perfluorinated hydrocarbon polymers as fillers in the adhesive compositions comprising spacers as disclosed by Dershem et al. ('962) and thereby obtain the present invention.

6. *Claims 1-6, 12-20, 8-39, 41, 42* are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over Dershem et al. (US 5,717,034).

The prior art to Dershem et al. ('034) discloses adhesive formulations comprising perfluorinated hydrocarbon polymers as fillers, a curing catalyst and optionally other additives such as coupling agents, additional fillers etc. (column 1, lines 58-68, column 2, lines 1-6). Monomer vehicles for use in the composition may be based on maleimides, (meth)acrylates, propargyl ether materials, silicone based adhesive formulations etc. (column 2, lines 15-68). The

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polymer particle is further characterized as having a particle size in the range of about 0.1 up to about 100 μm (column 9, lines 12-17). The method of adhesively attaching a microelectronic device to a substrate, assemblies comprising cured adhesive and a variety of substrates are disclosed (column 6, lines 56-68 and column 7, lines 1-20). Given the apparent identity of the adhesive composition of the prior art and the present invention, a reasonable basis exists to believe that the polymer particulate filler is inherently capable of functioning as spacers as claimed in the instant invention. It has been held that where applicant claims a composition in terms of function, property or characteristic where said function is not explicitly shown by the reference and where the examiner has explained why the function, property or characteristic is considered inherent in the prior art, it is appropriate for the examiner to make a rejection under both the applicable section of 35 USC 102 and 35 USC 103 such that the burden is placed upon the applicant to provide clear evidence that the respective compositions do in fact differ. *In re Best*, 195 USPQ 430, 433 (CCPA 1977); *In re Fitzgerald et al.*, 205 USPQ 594, 596 (CCPA 1980).

Allowable subject Matter

7. ***Claims 40*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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The following is a statement of reasons for the indication of allowable subject matter:

Claim 40 is directed to use of spacer particles constructed from organic polymers that include at least one reactive moiety. Prior art does not teach the use of functional polymers to obtain spacers for adhesive compositions. Therefore, the instant claim would be allowable over closest prior art to Dershem et al.

Conclusion


8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Satya Sastri at (703) 305-8490.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached at (703) 308-2450.

Any inquiry of a general nature or relating to the status of this application should be directed to the group receptionist at (703) 308-0661.

SATYA SASTRI

September 25, 2003


DAVID W. WU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700